

Current management of acute appendicitis in adults: What you need to know

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ABSTRACT: Acute appendicitis is one of the most common acute surgical diseases in the world today. Acute appendicitis can present with a well-recognized clinical presentation with abdominal pain which localize in the right lower quadrant. This presentation is more typical in men than in women of child bearing age. Several clinical and laboratory calculations can be used to increase the likelihood of making a correct diagnosis. Various imaging modalities can be used to make the diagnosis which include ultrasound, computer tomography, and magnetic resonance imaging. Each study has well known sensitivity/specificity of positive predictive value of making the diagnosis of appendicitis. The management of acute appendicitis is based on the presentation of the patient and dividing it into uncomplicated and complicated disease. Each requires management with antibiotics and followed with timely appendectomy. Recent studies have demonstrated nonoperative management of uncomplicated appendicitis without no fecalith that can be managed with antibiotics alone. Complicated acute appendicitis should undergo timely surgical intervention. Patients presenting with a large appendiceal abscess or phlegmon should undergo percutaneous drainage and antibiotic management. There are certain patient populations that should be considered for surgical intervention. Pregnant patients as well as immunosuppressed patients should undergo timely surgical intervention to decrease the risk of complications. This review outlines the current principles of the diagnosis, imaging, and treatment of acute appendicitis based on the best available evidence of acute appendicitis in adults. (*J Trauma Acute Care Surg.* 2025;98: 181–189. Copyright © 2024 Wolters Kluwer Health, Inc. All rights reserved.)

KEY WORDS: Acute appendicitis; uncomplicated appendicitis; complicated appendicitis.

DIAGNOSIS

The evaluation of the patient presenting with suspected acute appendicitis should focus on detecting all true cases, reducing unnecessary surgeries and complications. The diagnosis of acute appendicitis relies on a meticulous analysis of the patient's history, clinical features, and physical examination findings. The cardinal symptoms typical of acute appendicitis include right lower quadrant abdominal pain, anorexia, and nausea/vomiting. However, the patient may present with atypical symptoms that may include abdominal distension, constipation, and/or dysuria. In most patients, the presenting key finding is a physical examination with localized tenderness in the right lower quadrant, although it may not manifest in the initial stages or in all patients because of the anatomical position of the appendix. The appendix can present in any of the 360-degree positions centered around the base of the cecum including a retrocecal position and covered by the peritoneum.

Additionally, McBurney's point tenderness, Rovsing's sign, the psoas sign, and the obturator sign are diagnostic maneuvers that may provide diagnostic clues yet can vary in accuracy. Moreover, a wide differential diagnosis of right lower quadrant pathology will elicit other diseases that may be confused with acute appendicitis. This is especially important in women of child bearing age that can present with other pelvic pathology which can mimic acute appendicitis.

The clinical suspicion of acute appendicitis may be supported with laboratory findings such as elevated white blood cell count and serum C-reactive protein. Laboratory tests may often reveal a left shifted leukocytosis with a bandemia. A normal white blood cell count, especially in early stages, does not rule out the diagnosis of appendicitis. An elevated leukocyte count may indicate a more severe disease state with a gangrenous or perforated appendicitis. However, laboratory tests are not enough to confirm the diagnosis of acute appendicitis. In a large study of 1,024 patients with clinically suspected acute appendicitis, it was demonstrated that laboratory tests were not accurate to rule in or rule out the diagnosis. This highlights the need for a better evaluation tool.¹

The clinical assessment and laboratory test should be used to calculate clinical scores and used to stratify the probability of acute appendicitis. These scores are commonly used to proceed with additional patient evaluation and referral for radiological investigations (Table 1). The Alvarado score is a 10-point clinical scoring system used to determine the likelihood of acute appendicitis in patients presenting to the emergency department with abdominal pain. The area under the curve of the average Alvarado score ranged between 0.74 and 0.88, while that of the acute inflammatory response (AIR) ranged from 0.805

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TABLE 1. Modified Alvarado Score and AIR Score

Modified Alvarado Score	AIR Score
Migratory right lower quadrant pain (1)	Vomiting (1)
Anorexia (1)	Pain in RLQ (1)
Nausea or vomiting (1)	Rebound tenderness: – Mild (1) – Moderate (2) – Severe (3)
Tenderness in the right lower quadrant (2)	Feber >38.5°C (101.3°F) (1)
Rebound tenderness in the right lower quadrant (1)	WBC >10 × 10 ⁹ /L (1) WBC >15 × 10 ⁹ /L (2)
Fever >37.5°C (>99.5°F) (1)	Polymorphonuclear leukocytes: – 70–84% (1) – ≥85% (2)
WBC >10 × 10 ⁹ /L (2)	CRP, mg/L – 10–49 (1) – ≥50 (2)
Total = 9	Total = 12
Interpretation: – 0–3, Unlikely appendicitis – ≥4, Further evaluation	Interpretation: – 0–3, Low probability – 4–8, Intermediate risk – >8, High risk

to 0.97, with an average value of 0.872.² The sensitivity and specificity of the Alvarado score were 24% and 97%, and those of the AIR were 22% and 97%, respectively. Assuming a median acute appendicitis prevalence of 37%, this results in an Alvarado positive predictive value of 82% and AIR positive predictive value of 81%. Although a high specificity, the diagnosis of patients with acute appendicitis based on the Alvarado score alone would lead to a negative appendectomy rate up to 18%.^{1,3–6} The World Society of Emergency Surgery guidelines suggest stratifying suspected acute appendicitis based on clinical scores to determine who should undergo subsequent radiological evaluation.⁷

The diagnostic evaluation of acute appendicitis commonly involves the utilization of various imaging modalities such as ultrasound (US), computed tomography (CT), and magnetic resonance imaging (MRI). While US is typically cost-effective and readily available, CT and MRI offer superior diagnostic accuracy. Several meta-analyses have indicated that CT and MRI have higher sensitivity and specificity compared with US for detecting acute appendicitis (CT scan: sensitivity, 91%; specificity, 90%; MRI: sensitivity, 97%; specificity, 96%; US: sensitivity, 69%; specificity, 81%).^{8–10}

The choice of imaging modality commonly depends on the availability, cost, and potential risks associated with radiation and/or contrast use. Magnetic resonance imaging is the best-performing diagnostic test, but it has the great limitations because of its scarce availability at all times of the day and examination duration, which can be up to 30 minutes. Contrast-enhanced CT scan is the best screening technique, as it is widely available and has a high degree of accuracy for diagnosis of acute appendicitis. A large nationwide population study demonstrated that patients undergoing abdominopelvic CT for suspected appendicitis had a higher incidence of hematologic malignant neoplasm (incidence rate ratio, 1.26; 95% CI, 1.09–1.45;

$p = 0.002$).¹¹ Considering that the prevalence of acute appendicitis is higher in younger patients, the choice of CT scan should be made judiciously and choosing low-radiation dose image acquisition protocols should be used, which have similar diagnostic accuracy.¹²

Ultrasound serves as a valuable imaging modality in the diagnostic acute appendicitis evaluation, particularly in settings where CT is not readily available or when there are concerns about radiation risks. Advantages of US include its noninvasive nature, absence of ionizing radiation and intravenous contrast, and bedside accessibility. Point-of-care US has been demonstrated to have similar diagnostic accuracy to the radiologist performed US.¹³ However, US exhibits lower diagnostic accuracy compared with CT or MRI, because of various patient- and operator-specific factors. While a positive US result suggests initiation of treatment for appendicitis, a nondiagnostic US result does not reliably rule out appendicitis, necessitating further imaging evaluation.

A pragmatic approach involves initial screening with US followed by CT or MRI if the initial US is inconclusive or negative. Combining US with conditional CT or MRI has shown promising diagnostic performance, with high sensitivity and specificity. A recent large multicenter study demonstrated the combination of clinical scores and US as the best performing strategy to select patients with acute appendicitis.¹⁴ Nonetheless, each imaging modality has its limitations, including variability in interpretation, radiation exposure with CT, and logistical challenges with MRI. Despite these limitations, appropriate utilization of imaging techniques has been shown to be cost-effective and can reduce unnecessary appendectomy rates. Lastly, proven that no definitive imaging strategies have been demonstrated to be the absolute best, imaging modality should be tailored to local facilities.

The American Association for the Surgery of Trauma has developed a classification for acute appendicitis mirroring the system used for traumatic injuries (Table 2).¹⁵ Several studies have looked at the diagnosis of acute appendicitis, and less have focused on distinguishing between uncomplicated and complicated disease. The differentiation between uncomplicated and complicated acute appendicitis is a critical diagnostic decision point. Acute appendicitis can be classified into complicated if there is a peri-appendicular or distant abscess, perforation, or diffuse peritonitis and requests urgent surgical management. There are various scoring systems integrating clinical, biochemical, and imaging features that have been proposed for classifying acute appendicitis including the scoring systems for Appendicitis Severity (SAS and SAS 2.0) and the Appendicitis Severity Index, demonstrating promising diagnostic capabilities (Table 3).^{17,18} However, these systems lack external validation in prospective studies.

Imaging modalities, particularly CT, have been extensively studied, showing high specificity but variable sensitivity in detecting complicated appendicitis.¹⁹ The most noteworthy finding is the presence of an appendicolith that has emerged as a significant predictor of failure of nonoperative management, impacting treatment outcomes and recurrence rates.²⁰ Further research is warranted to better elucidate the diagnostic accuracy of radiologic examinations in detecting the presence of appendicoliths.³

MANAGEMENT: UNCOMPLICATED
AND COMPLICATED

Risk of Recurrence of Appendicitis Versus Risk of
Operative Management

The management of appendicitis is based on the severity of the disease. There are several patient care guidelines that have been developed over the last many years. The Eastern Association for the Surgery of Trauma guidelines were unable to make a clear recommendation for antibiotics only for uncomplicated appendicitis.²¹

There have been several classification criteria that have been developed to describe the severity of the disease that matches the clinical presentation, radiological imaging, and clinical outcomes of the patients (Table 2).²² In clinical practice, acute appendicitis can be divided into two groups — uncomplicated and complicated appendicitis.^{23–25} In addition, the overall fitness of the patient may help decide on operative or nonoperative management of the patient.²⁶ All patients with acute appendicitis, whether they are managed operatively or nonoperatively, should be started on empiric broad spectrum antibiotic coverage. Early empiric antibiotic coverage has been shown to reduce postoperative surgical site infections.²⁷

Patients with complicated acute appendicitis presenting with acute peritonitis should undergo emergency surgery using either open or laparoscopic approach. This is depending on whether your patient has localized peritoneal irritation in the right lower quadrant or presents with generalized peritonitis in septic shock. If during the surgical procedure you find only localized disease, the current recommendations are to perform only limited suctioning and irrigation of visible contamination alone versus whole abdominal irrigation of the peritoneal cavity.⁷ Whole abdominal irrigations in this setting have shown increased risk of distance surgical site infection. It is imperative that all appendicoliths are removed, as these can act as a nidus for postoperative intra-abdominal abscess.

Perforation at the base of the appendix with associated cecal inflammation may require ileocecectomy to adequately close the base of the appendix and to prevent an appendiceal stump leak. These are important aspect of good surgical judgment when performing a laparoscopic appendectomy and you discover a very inflamed appendiceal base. The practice of drain placement remains controversial, as drain placement in the setting of perforated appendicitis has been shown to increase length

TABLE 3. Scoring Systems for Appendicitis Severity (SAS and SAS 2.0) and the APSI

APSI Score	SAS 2.0
Age ≥52 y (1)	Age
Temp ≥37.5°C (1)	Temperature
Duration of symptoms ≥48 h (1)	Numerical pain rating scale
Appendix diameter ≥14 mm (1)	C-reactive protein
Peri-appendiceal fluid (2)	WBC count
Extraluminal air present (1)	Appendiceal diameter
Abscess present (3)	Intra-abdominal abscess
	Appendicolith
	Free abdominal air
	Free fluid
	Appendiceal wall destruction
	Fat infiltration
Total: 10	
Interpretation: ≥4 Complicated acute appendicitis	Interpretation: Probability of complicated appendicitis
APSI, Appendicitis Severity Index.	

of stay and not reduce the incidence of intra-abdominal infection or to improve clinical outcomes.^{28,29}

Appendectomy has been the definitive treatment of acute appendicitis since 1735.³⁰ In numerous studies, a surgical delay of up to 12 to 24 hours is safe in uncomplicated acute appendicitis and does not increase complications and/or perforation rate in adults.⁷ McBurney³¹ codified the open surgical technique of exposure of the appendix in the right lower quadrant in 1894. The open technique remains a valuable option in the setting of severe appendiceal inflammation where an ileocecectomy must be performed or in the setting of intra-abdominal adhesions that make laparoscopic appendectomy prohibited. Persisting with an attempt at a laparoscopic appendectomy only to create additional enterotomies to repair would seem unwise in a sick patient.

Laparoscopic appendectomy was introduced in the 1980s and has become the preferred approach to acute appendicitis given the reduction in less pain, shorter length of stay, faster return to work, and lower incidence of surgical site infection.^{32,33} The laparoscopic approach allows for an ability to make alternative diagnoses in the peritoneal cavity, which can be difficult via a right lower quadrant incision.

TABLE 2. AAST Classification for Acute Appendicitis

AAST EGS Grade: Clinical, Imaging, Operative, and Pathologic Criteria	
Normal appendix	
Uncomplicated	
Grade I	Acute inflamed appendix intact
Complicated	
Grade II	Gangrenous appendix intact
Grade III	Perforated appendix with local contamination
Grade IV	Perforated appendix with periappendiceal phlegmon or abscess
Grade V	Perforated appendix with generalize peritonitis

Source: Finnesgard et al.¹⁶
AAST, American Association for the Surgery of Trauma.

The surgical management of uncomplicated acute appendicitis has continued to evolve as more data become known. There are several randomized controlled trials that have demonstrated the successful treatment of uncomplicated appendicitis with antibiotics alone.^{34–38} In one study, comparing open appendectomy to antibiotics alone, there were increased complications at 1 year and 5 years with open appendectomy, 20.5% in 1 year and 24.4% in 5 years versus 2.8% and 6.5% respectively in the antibiotics group. Randomized controlled trials evaluating laparoscopic appendectomy to antibiotics on the other hand did not consistently demonstrate reduced complications when comparing antibiotics to appendectomy, with some trials demonstrating increased risk with nonoperative management.^{34–38} The most common complication in the antibiotics alone groups were intra-abdominal abscesses, while small bowel obstructions were seen in the groups undergoing surgical appendectomy. The APPAC (Antibiotic Therapy vs. Appendectomy for Treatment of Uncomplicated Acute Appendicitis) and CODA (Comparing Antibiotics with Appendectomy for Appendicitis) trials demonstrated that antibiotics alone were noninferior to appendectomy for uncomplicated appendicitis. There is risk of long-term recurrence, with APPAC demonstrating 39.1% at 5 years and CODA demonstrating 49% at 4 years.^{3,20–34} When deciding on nonoperative treatment for uncomplicated acute appendicitis, a discussion about the known risk and benefits of each treatment modality should be reviewed with the patient and allow for joint surgical decision making. Surgical appendectomy is effective and has low failure rates and low rates of recurrence (1 in 50,000 appendectomies).³⁹ However, antibiotics are an acceptable treatment modality of patients with uncomplicated acute appendicitis (Table 4).

It is important to balance the clinical decision to choose a course of treatment, which works well for uncomplicated acute appendicitis. You should have an established patient care protocol to guide providers and measure clinical outcomes.⁴⁰ In reviewing multiple meta-analysis, they have shown that nonoperative management with antibiotics alone demonstrated a lower complications rate and a shorter length of stay. In general, this

would seem to be a good clinical decision. Nonetheless, antibiotics alone for uncomplicated acute appendicitis has a lower overall effective rate and higher recurrence rate.^{41–46} As such, antibiotics alone does not “cure someone of appendicitis.” It is also critically important that nonoperative management is not the best course of treatment for complicated acute appendicitis.

APPENDICULAR ABSCESS

The best treatment of appendicular abscess is not straightforward. Historically, immediate surgical intervention had been linked to higher morbidity rates and the need for more extensive surgery requiring ileocolic resections.⁴⁷ Today, patients presenting with contained peri-appendiceal abscesses (not greater than 4–6 cm) are commonly managed with antibiotics with or without percutaneous drainage depending on the size of the abscess. The size of the abscess, its location, and percutaneous access determine the addition of drain placement. No definitive data exist regarding the efficacy of nonoperative management associated to drain for abscesses larger of 4 to 6 cm. It is important to note that drain placement constitutes an initial clinical maneuver for source control in this setting. Nonoperative management with antibiotic therapy and percutaneous drainage has been demonstrated to have success rates exceeding 90% and a low risk of recurrence. Several studies have compared the outcomes of nonoperative management versus immediate appendectomy, revealing lower overall complication rates associated with nonoperative management^{48,49} (Fig. 1).

In patients with small peri-appendiceal abscess, recent evidence suggests that laparoscopic appendectomy performed by experienced surgeons may offer advantages over conservative treatment, such as shorter hospital stays and reduced need for readmissions. In addition, early laparoscopic appendectomy has shown promising outcomes, including fewer readmissions and additional interventions compared with nonoperative management especially in the setting with advanced laparoscopic capabilities.^{49–51} The choice between nonoperative management and operative management should consider factors such as patient

TABLE 4. Appendectomy Versus Nonoperative Management

Source	Sample Size	Treatment	Primary Outcomes	Secondary Outcomes
The APPAC Randomized Clinical Trial, 2015	Abx: 257	Open appendectomy vs. antibiotics	Abx: 72% did not have recurrence of symptoms at 1 y. 27.3% underwent appendectomy.	Surgery: 20% complication rate (SSI, incisional hernia, abdominal/incisional pain/obstructive symptoms)
<i>JAMA</i> . 2015;313 (23):2340–2348	Surgery: 273*			Abx: 2.8% (abdominal pain/obstructive symptoms)
The CODA Collaborative, 2020	Abx: 776	Laparoscopic or open appendectomy vs. antibiotics	Abx: 30 QOL score was noninferior to appendectomy	Abx: 90-d treatment failure was 29%, increasing to 41% if appendicolith present
<i>N Engl J Med</i> . 2020;383 (20):1907–1919	Surgery: 776			Abx: 8.1% complication rate, predominately in patients with appendicolith (increased need for percutaneous drainage procedures)
ACTUAA Study Collaborative Working Group, 2021	Abx: 87	Laparoscopic or open appendectomy vs. antibiotics	Abx: 74% did not have recurrence of symptoms at 1 y. 26% underwent appendectomy. Less posttreatment complications vs. surgery	Surgery: 3.5% complication rate
<i>Int J Colorectal Dis</i> . 2021;36(3):589–598	Surgery: 231*			Abx: overall lower pain scores

*Patients with appendicoliths were excluded.

ABX, antibiotics; SSI, surgical site infection; QOL, quality of life.

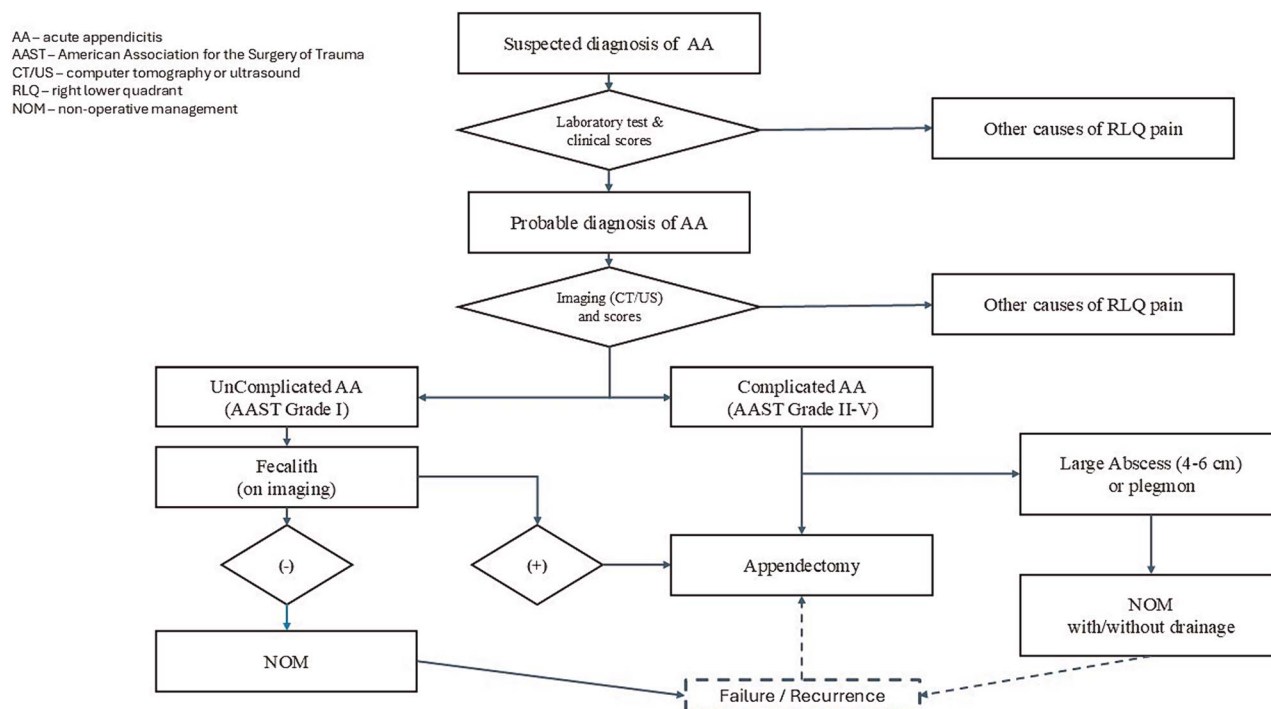


Figure 1. Algorithm for the management of acute appendicitis in adults. Legend: The algorithm divides patients into uncomplicated versus complicated acute appendicitis. Patients with uncomplicated appendicitis without imaging suggestive of a fecalith may be candidates for antibiotics alone. Most patients with more severe complicated appendicitis (AAST scores II–V) may require intervention for source control. Most patients will require an appendectomy versus a drain placement for a contained abscess. AA, acute appendicitis; AAST, American Association for the Surgery of Trauma; Max, maximum; NOM, nonoperative management; RLQ, right lower quadrant.

condition, surgical expertise, and available resources. There is higher reported risk for cancer (up to 16%) in patients with appendicular abscess treated with nonoperative management, and interval appendectomy should be recommended.^{52,53}

ANTIBIOTIC THERAPY

The management of acute appendicitis as in all the abdominal infections must be based on obtaining adequate source control depending on disease stratification⁴⁷ and potential antibiotic therapy. In patients undergoing appendectomy for acute appendicitis, compelling evidence supports the use of preoperative broad-spectrum antibiotics to reduce the risk of wound infection and intra-abdominal abscess.⁵⁴ Overall, evidence available underscores the importance of antibiotic stewardship and individualized treatment strategies based on the severity of appendicitis and surgical outcomes.

In the case of uncomplicated acute appendicitis managed with surgery, additional postoperative antibiotic therapy is not indicated. In these patients, a single preoperative dose of broad-spectrum antibiotics has been demonstrated to be effective in preventing surgical site infection and abdominal collections.^{55–57}

In patients with complicated appendicitis, postoperative antibiotic therapy should be continued according to adequacy of the source control and patient clinical condition. The optimal duration of postoperative antibiotic therapy remains a subject of debate. In case of adequate source control, the recommended duration is a short course of 4 to 5 days after the perioperative

dose.^{56–59} In patients without source control or the inability to obtain adequate source control, postoperative antibiotic therapy should be tailored according to the clinical response.

Antibiotic therapy should be targeted to the colonic flora, against gram-negative aerobes and anaerobes, according to international guidelines on the treatment of intra-abdominal infections⁵⁷ and to the potential contaminating local bacterial flora. Routine use of antifungal agents is not recommended.

APPENDICITIS IN SPECIAL SITUATION

Appendicitis in Pregnant Patients

Acute appendicitis is the most common nonobstetrical surgical emergency in pregnant women. The incidence of acute appendicitis is the same in nonpregnant and pregnant patients. It has been reported to be 1/1,250 and 1/2,000.^{60,61} The rate of acute appendicitis during pregnancy is similar during the first and second trimester (7.4 and 7.3/10,000 person-years) and lower in the third trimester 4.6/10,000 person-years.⁶¹ Additional studies looking at the incidence of appendicitis before, during, and after pregnancy appear to suggest that there is a protective effect of pregnancy on the development of acute appendicitis, which is followed by a rebound after childbirth.⁶²

Acute appendicitis in pregnancy remains a clinical diagnosis that can be challenging. All pregnant patients suspected of acute appendicitis should undergo imaging, as a blind surgical exploration even in the era of laparoscopy can lead to a high negative appendectomy rate (30%).^{63,64} Diagnostic US should be the initial modality, as there is no radiation energy and can be

repeated in a thin pregnant woman during the first and second trimester. A compressible appendix along with a diameter of less than 5 mm is used to exclude appendicitis. Ultrasonographic findings suggestive of acute appendicitis include an anteroposterior appendiceal diameter of >6 mm, the presence of an appendicolith, and abnormally increased echogenicity of the peri-appendiceal fat. The major concern with using abdominal ultrasonography to evaluate the potential diagnosis of acute appendicitis are the limitations of ultrasonography in patients with obesity and the operator dependency. Patients with peritonitis are less likely to tolerate the graded compression.^{65,66} Ultrasonography is a user-dependent tool, and the gravid uterus may reduce US sensitivity and specificity for acute appendicitis.⁶⁶

Organogenesis of the fetus is complete after the first trimester, which makes CT scan imaging less risky to the fetus. As such, CT scan imaging for the diagnosis of acute appendicitis is the preferred modality during the second and third trimesters of pregnancy because of the availability during off hours.^{67,68} Computed tomography scan has been reported to have a sensitivity of 100% for diagnosing appendicitis in pregnant women, whereas ultrasonography had a sensitivity of 46.1%, and both techniques had a specificity of 95.4%.^{69–71} Magnetic resonance imaging is safe during all trimesters of pregnancy but best in third trimester. Magnetic resonance imaging has a sensitivity of 91.8% and a specificity of 97.9% for diagnosing acute appendicitis in pregnant women. Magnetic resonance imaging is more successful at diagnosing appendicitis in pregnant women than CT or US because it gives a complete evaluation of the abdomen. However, MRI adds to health care costs, is time-consuming, and is not widely available. All imaging modalities have potential risk of false negative results (2–5%).⁷²

In the pregnant patient, antibiotics alone in the nonoperative management of acute appendicitis should only be done in the setting of perforation with contained abscess that can be drained.⁷³ Nonoperative management has a higher rate of mischarge compared with operative management. There is no difference between operative versus nonoperative for maternal outcomes, as far as length of stay.⁷⁴

The rate of maternal mortality is rare (0.006%). The miscarriage rate was 5.8% with a rate of fetal loss 2.5%, and fetal loss associated with appendectomy was 2.6% with the rate increased when peritonitis was present (10.9%).⁷⁵

Laparoscopic appendectomy has become the standard of care. In the pregnant patient with acute appendicitis, laparoscopic appendectomy is more commonly done in the first and second trimester and has the benefits of shorter hospital stay and less pain. Nonetheless, it has been reported to have a higher rate of fetal loss. Open appendectomy is more common in the third trimester and has a higher rate of prolongation of gestational age for term deliveries.^{76,77} In the ERAS (enhanced recovery after surgery) guideline, a systematic review and meta-analysis, it suggests operative treatment over conservative management in pregnant patients with uncomplicated appendicitis and no appendicolith on imaging studies (weak recommendation). There was a strong recommendation to perform appendectomy for complicated appendicitis or appendicolith and laparoscopic or open appendectomy after the 20th week of gestation.⁷⁸

Appendicitis in Immunocompromised Patients

There are limited data on the management of acute appendicitis in immunocompromised patients.⁷⁹ These patients do not follow the typical course, and their presentation can be late or mimic other conditions in the immunocompromised patient. In a series of cancer patients, many of whom were neutropenic at presentation, the majority (62.5%) were treated with antibiotics alone, 25% went straight to appendectomy, and 12.5% required drainage by interventional radiology and antibiotic treatment.⁸⁰ Acute appendicitis in the immunocompromised patient should be managed with appendectomy. Transplant patients should undergo surgery within 24 hours of diagnosis.⁸¹

Acute appendicitis during the COVID pandemic is worth reviewing. In a large study of the National COVID Collaboration from 2020 to 2023 in 37,868 patients, which included 34,866 COVID negative, 2,540 COVID active, and 460 COVID recovered, COVID-active and -recovered patients less often underwent operative management. The adjusted analysis indicated, when patients were compared with operative, nonoperative management carried higher odds of mortality and readmission for COVID-negative and COVID-active patients.⁸²

Another population that may not be considered immune compromised yet are at higher general risk is the geriatric frail surgical patient. Nonoperative management may not be the best surgical decision. A study using the Nationwide Readmissions Database included all frail geriatric patients (65 years or older) with a diagnosis of acute uncomplicated appendicitis where frailty was assessed and measured. Patients were divided into appendectomy during index admission versus antibiotics only. A 1:1 propensity matching analysis was performed. There was one in six patients who failed antibiotics only for acute uncomplicated appendicitis within 6 months and required appendectomy. This population had more complications and higher mortality.⁸³

INTERVAL APPENDECTOMY

For patients treated for uncomplicated acute appendicitis with nonoperative management, there are data that suggest that there is no indication for interval appendectomy. Interval appendectomy is a surgical procedure recommended for patients who have successfully undergone nonoperative management for complicated appendicitis (abscess or perforation). The major concern is to exclude the possibility of an appendiceal neoplasm that has a higher prevalence in such cases compared with routine appendectomy specimens. All patients older than 40 years treated with nonoperative management should be carefully evaluated and should undergo colonoscopy to better plan surgical intervention. Patients with advanced age, multiple comorbidities, atypical presentation, and complicated appendicitis should be considered for appendectomy during the index admission or at earliest convenience if nonoperative management is necessary.⁸⁴ Studies have shown that the prevalence of appendiceal neoplasms in interval appendectomy specimens after complicated acute appendicitis can range from 10% to 20% in general population and begins to rise to 29% in adults older than 40 years.^{52,53,85,86} These neoplasms included low-grade appendiceal mucinous neoplasms, serrated adenomas, adenocarcinomas, carcinoid tumors, and pseudomyxoma peritonei.⁴⁶ Interval appendectomy also

helps prevent recurrent appendicitis that occurs in 5% to 38% of all patients treated nonoperatively.

AUTHORSHIP

J.D. and F.C. contributed in the conception and study design. J.D., M.C., T.H., and F.C. contributed in the literature review, data acquisition, data analysis and interpretation, drafting of the manuscript, and critical revision.

DISCLOSURE

Conflicts of Interest: Author Disclosure forms have been supplied and are provided as Supplemental Digital Content (<http://links.lww.com/TA/E52>).

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